

TRILOBODRILUS INDICUS N. SP. (DINOPHILIDAE, ARCHIANNELIDA) FROM ANDHRA COAST

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ABSTRACT

A new species of interstitial archiannelid *Trilobodrilus indicus*, collected in the intertidal sands of Waltair coast (Bay of Bengal), India, is described in this paper. The archiannelid markedly differs from the earlier known species of the genus and is distinguished from its closest relative *T. heideri* Remane, by its smaller size, shape of prostomium, deeply notched pygidium, structure of epidermal glands and the position of gonads.

INTRODUCTION

DURING a brief investigation of interstitial fauna in the intertidal sands of Waltair coast and its environs, undertaken by the Zoological Survey of India during November–December 1968, the author encountered considerable numbers of an archiannelid belonging to the genus *Trilobodrilus* Remane. A detailed examination of the material has shown that the specimens markedly differ from the known species of the genus and hence it is described here as a new species under the name *T. indicus*. The occurrence of some archiannelids from the beach sands of Waltair coast has been reported in an earlier investigation of the area (Chandrasekhara Rao and Ganapati, 1968 a, b).

MATERIAL AND METHODS

The method adopted for the collection of the worms was given in the earlier publication (Chandrasekhara Rao and Ganapati, 1968 b). The morphological features of the specimens are best observed in the living condition. The worms were fixed by the sudden addition of hot Bouin's fluid to a small quantity of sea-water containing the forms in a relaxed condition, when they could be easily fixed without coiling or contraction. The material was preserved in 5% formalin containing 2% glycerine. Salinity tolerance

experiments of the species were conducted at room temperature (28° C–30° C) by the method followed by Boaden (1963).

Holotype.—Female specimen 1.0 mm long, with ova, collected by the author on 26 November 1968. Deposited with the Zoological Survey of India, Calcutta. Regd. No. An 198/1.

Type locality.—Intertidal zone, 10–40 cm below surface, Palm Beach (Lat. 17° 43' 30" N and Long. 83° 20' 30" E), Waltair, Andhra Pradesh, India.

Paratype.—Male specimen 1.0 mm long, with sperm and the same collection data given for the holotype. Deposited with the Zoological Survey of India, Calcutta. Regd. No. An 199/1.

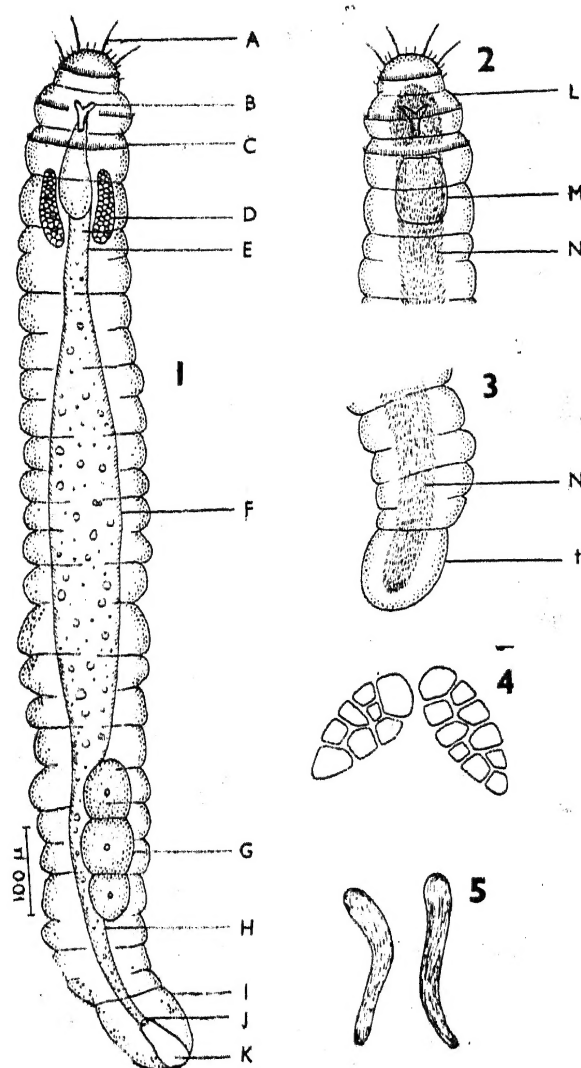
DESCRIPTION

The length of adult specimens of *Trilobodrilus indicus* ranges from 1.0 to 1.2 mm depending on the state of extension, while the width at broadest portion measures between 0.10 mm and 0.12 mm. The body is elongate, vermiform and dorso-ventrally flattened, with both the ends slightly tapering. The worms are nearly colourless and transparent. The body is highly contractile and thigmotactic. The species is agile and also moves in a leech-like fashion. The head is trilobate and divided into two portions by a lateral furrow; the first part bears a fine and complete ciliary ring, while the second part has a fine ciliary ring discontinuous on dorsal surface. Eyes are absent. Fine sensory bristles of varying size occur on the anterior part of head, of which 4 bristles are prominent. The Y-shaped mouth opens on ventro-median surface of the second part of the head, extending to its posterior border.

The body segmentation is more or less indistinct, although 13 segments are apparent excluding head and pygidium. Each body segment from third segment caudad, is divided by a deep annulus. The first body segment bears a complete ciliary ring. Lateral tufts of cilia are absent on body segments. Pygidium is distinct, elliptical, deeply notched on dorsal surface and adhesive. Anal opening is situated on dorso-median surface of pygidium at the base of the notch.

The integument is devoid of ornamentation. Well developed epidermal glands occur on body surface. These glands are spindle-shaped and measure

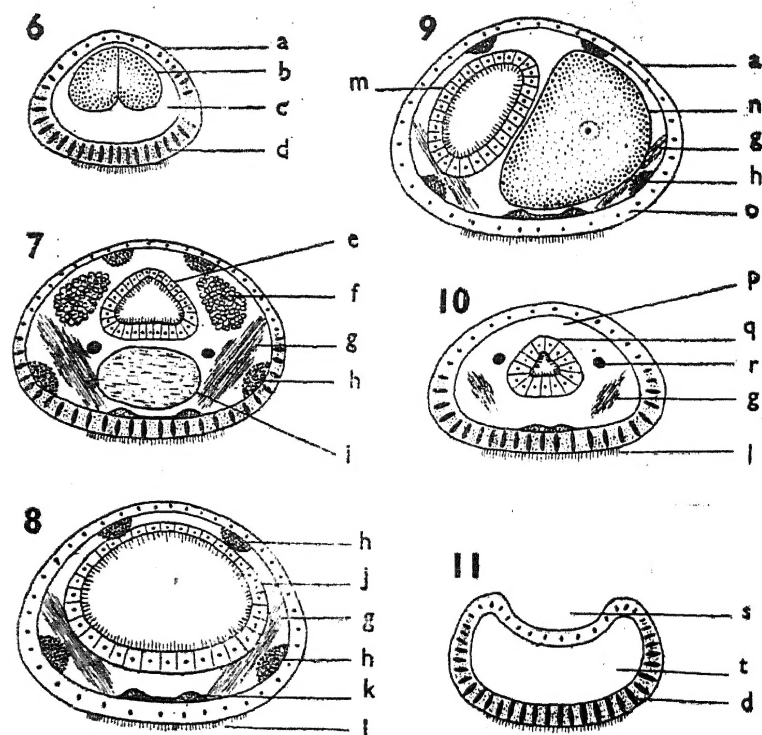
about 12μ long; each gland is composed of 7-11 mosaic, refractive cells. Interspersed between the glands occur vermiform bacillary glands measuring $12-16\mu$ long. The ciliation forms a continuous field on the ventral surface, extending from the anterior end to the posterior end of body, with a pronounced median growth.



FIGS. 1-5. *Trilobodrilus indicus* n.sp. Fig. 1. Female, dorsal view; Fig. 2. Anterior end, ventral view; Fig. 3. Posterior end, ventral view; Fig. 4. Epidermal glands; Fig. 5. Bacillary glands. A. Sensory bristle; B. Mouth; C. Ciliary ring; D. Salivary gland; E. Oesophagus; F. Stomach; G. Ovum; H. Intestine; I. Pygidium; J. Anus; K. Notch; L. Head; M. Pharynx; N. Ventral ciliation.

The internal organisation more or less follows the usual pattern. The body is roughly semicircular in transverse section, the ventral side being somewhat flattened. There is an outer covering of a very thin cuticle, below

which lies the single-layered epidermis. Large glandular cells are arranged in several rows, especially on the head and ventral surface of pygidium. The ventro-median part of body is lined with ciliated cells. Circular muscles are not seen. Below the epidermis occur 4 bands of well-developed longitudinal muscles. Oblique muscles are seen with their lower ends inserted on either side of the dorsal aspect of the nerve cord. These muscles are poorly developed towards posterior extremity of the body.



FIGS. 6-11. Transverse sections of *Trilobodrilus indicus* n.sp. Fig. 6. Head region; Fig. 7. Pharyngeal region; Fig. 8. Stomach region; Fig. 9. Genital region; Fig. 10. Rectum region; Fig. 11. Pygidium. *a.* cuticle; *b.* brain; *c.* head-cavity; *d.* adhesive gland; *e.* oesophagus; *f.* salivary gland; *g.* oblique muscle; *h.* longitudinal muscle; *i.* pharynx; *j.* stomach; *k.* nerve cord; *l.* cilia; *m.* intestine; *n.* ovum; *o.* epidermis; *p.* coelom; *q.* rectum; *r.* vessel; *s.* notch; *t.* tail-cavity.

The alimentary canal is straight and lined with ciliated cells throughout its length. In a cross-section, the gut is mostly wider than high. The muscular, protrusible pharynx is oval in shape and ventrally situated, occupying the first and second body segments. The Y-shaped mouth is highly ciliated and leads into a narrow oesophagus, which extends to the middle of the fourth body segment. A pair of sac-like salivary glands occur on either side of oesophagus. The stomach is a spacious sac, occupying about six seg-

ments, extending from the fifth to the tenth segment. The intestine is narrow and opens outside by the anus.

The nervous system consists of a brain and a pair of ventral longitudinal nerve cords, which are widely separate and closely pressed against the epidermis. The circulatory system is apparently represented by two longitudinal vessels, running laterally to the alimentary canal.

No detailed observation could be made on the structure of excretory and reproductive systems. Sexes are, however, separate. In ripe females, 3-5 ova measuring about $65\ \mu$ in maximum diameter were observed from ninth segment caudad and their growth greatly suppresses the intestine. Each ovum has a clear, centrally placed nucleus. In male, paired testes occur between tenth and eleventh segments, from where the sperms are seen exuding. The sperms are densely packed and thread-like, measuring about $120\ \mu$ in length. Nothing is known about the method of development.

TAXONOMY

The genus *Trilobodrilus* was established by Remane (1925) for the reception of the peculiar psammophilous archannelid *T. heideri*, found at Helgoland in North Sea. Subsequently, two more species *T. nipponicus* Uchida and Okuda (1943) and *T. axi* Westheide (1967) were added to the genus from Akkashi Bay in Japan Sea and Sylt Island in North Sea, respectively. The present discovery of a new species *T. indicus* from Andhra coast in the Bay of Bengal, extends the distribution of the genus to wide geographical regions. A perusal of description of these four species shows close resemblance in the organisation of their body. Little is known of their anatomy and hence taxonomic characters are to be based mostly on external morphology, such as the number of body segments, structure of head and pygidium, distribution of ciliary rings, lateral tufts of cilia, tactile bristles, structure of epidermal glands, etc.

Among the three earlier known species, *T. indicus* is closely related to *T. heideri* in the shape and annulation of body, distribution of ciliary rings, absence of lateral tufts of cilia and the form of pygidium. However, *T. indicus* is easily distinguished from *T. heideri* by the smaller size, shape of prostomium, deeply notched pygidium, complete ciliary ring on first thoracic segment, presence of a deep annulus on each segment from third segment caudad, structure of epidermal glands and the position of gonads.

The diagnostic features of *T. indicus* can be summarised as follows: Length 1.0-1.2 mm. Body transparent and highly contractile. Thirteen

body segments excluding head and pygidium; each segment with a deep annulus from third segment caudad. Two fine ciliary rings on head and one on first body segment. Epidermal glands spindle-shaped with 7-11 mosaic cells. Lateral tufts of cilia absent. Pygidium distinct and deeply notched dorsally. Gonads develop from ninth segment caudad.

GENUS *Trilobodrilus* REMANE

Dinophilidae with body small, vermiform, dorso-ventrally flattened and without parapodia or setae. Head trilobate, without eyes. Body segmentation more or less indistinct. Pygidium simple and adhesive. Head and pygidium without appendages. Apical tactile bristles present. Head and first 1 or 2 segments with fine ciliary rings. Second ciliary ring discontinuous on dorsal surface of head. Mouth Y-shaped. Pharynx ventral and protrusible. Oesophagus with a salivary gland on either side. Anus dorsal. Sexes separate. Ciliary gliders. Marine.

KEY TO THE SPECIES

The following key based mostly on external characters has been prepared to distinguish the four species now included in the genus *Trilobodrilus*.

1. Body with 7 segments excepting head and pygidium. Pygidium indistinct .. *T. axi* Westheide, 1967
- Body with 13 segments excepting head and pygidium. Pygidium distinct 2
2. Head divided into 3 portions by two lateral furrows; bears 1 dorsal and 4 anterior tactile, stiff spines. Each body segment with a pair of lateral tufts of cilia. Pygidium spoon-shaped *T. nipponicus* Uchida and Okuda, 1943
- Head divided into 2 portions by a lateral furrow; without spines. Body without lateral tufts of cilia. Pygidium not spoon-shaped 3
3. Epidermal glands with 7-11 mosaic cells. Pygidium deeply notched dorsally. Gonads develop from ninth segment caudad .. *T. indicus* n. sp.

Epidermal glands with 3-5 mosaic cells.

Pygidium bare. Gonads develop from

fourth segment caudad *T. heideri* Remane, 1925

ECOLOGY

The archiannelids were collected in medium sands with little detritus at a depth of 10-40 cm below surface between tide marks. However, the worms were more common near the half-tide level than the lower or higher levels of the intertidal zone. The distribution of the species shows penetration into deeper layers towards higher levels, like bulk of the interstitial fauna, seeking optimum conditions of temperature and water circulation in the habitat. The texture of sands varied between 300μ and 500μ in mean diameter. Temperature in the habitat varied from 26°C to 30°C , while the salinity of interstitial water ranged between 22‰ and 33‰. The field distribution of the species indicates that the forms withstand a fairly wide range of environmental variation.

Experiments conducted in the laboratory on the salinity tolerance of *T. indicus* indicated that the species is resistant to a wide range of fluctuations in salinity. The worms kept in various concentrations (5-50‰) of normal sea-water (32‰), showed tolerance between the gradients 14‰ and 42‰, with 32‰ as the optimum range. The forms showed longer survival time in lower salinity than in higher salinity, indicating their susceptibility to higher salinity than lower salinity grades. Gradual decrease in salinity facilitated longer periods of survival of the animals than sudden changes. These results are in conformity with those reported earlier by Wieser (1957) for the archiannelid *Nerilla digitata* on American coast and Boaden (1963) for *Trilobodrilus heideri* on British coast.

Among the associated interstitial fauna occurring in the same biotope are the hydrozoan *Halammohydra octopodides* Remane, the turbellarians *Baltoplana magna* Karling and *Macrostomum* sp., the nematodes *Enoploides harpax* Wieser and *Desmoscolex bengalensis* Timm, the gastrotrichs *Thaumastoderma heideri* Remane, *Pseudostomella indica* Rao and *Xenotrichula velox* Remane, the kinorhynch *Cateria gerlachi* Higgins, the archiannelid *Diurodrilus benazzii* Gerlach, the polychaetes *Hesionides gohari* Hartmann-Schroder, *Petitia amphophthalma* Siewing and *Sphaerosyllis bengalensis* Rao and Ganapati, the oligochaete *Michaelsena* sp., the ostracod *Microcythere subterranea* Hartmann, the copepods *Arenopontia indica* Rao and *Sewellina reductus* Krishnaswamy and the acarine *Halacarus anomalus* Trouessart.

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